The preheating before mentioned is brought about expediently by means of utilising the waste heat of the issuing gases, a portion of which is in this way returned, and would have been otherwise irrecoverably lost.

The process of regeneration is divided into two portions. First of all, the issuing gases are deprived of their surplus heat by means of being passed through chambers or regenerators, built of refractory material, and fitted with a checker work of the same material, which forms small passages. This checker work is heated by the outgoing gases, which latter are correspondingly cooled down. Finally, an equilibrium is established between the temperature of the outlet gases and that of the checker work, for each portion of the chambers,

In order to return to the furnace the heat taken up by the checker work the second portion of the operation is carried out. The current of the outlet gases is stopped and diverted to the other (cold) chambers, whilst the gas and air currents are passed through the preheated chambers and are drawn into the furnace for combustion. In order that the operation described can proceed regularly the chambers must be arranged in corresponding numbers. The change of the current of gas is brought about by special reversing devices which are operated in the appointed intermediate space. Owing to this the whole furnace system is brought completely into a stable condition and is self-contained.

The gas and air are in a strongly-preheated condition as they enter the combustion chamber of the furnace and unite to form the flame. The latter plays against the surface of the charge, and thus the free energy of the flanie is applied in the most direct manner for efficient melting. The transference of the heat to the charge in the open-hearth furnace is thus from the upper surface, and as the hotter portions of the bath are lighter, and therefore swim on the surface, so the heat is only transferable to the colder portions by conduction so long as the metal remains quiescent. Equal heating of the entire charge of metal is, therefore, the slower, the deeper the bath ; but if a condition of the bath is established in which cold portions are brought to the upper surface, and therefore in